**Claims**

1. A tool holder for a tool which can rotate about an axis of rotation (D) in particular a drilling, milling, reaming or grinding tool, comprising a clamping shank which, at one end region, has a clamping formation (14) for securing the tool coaxially and, at its other end region has a coupling formation (12) for coaxial coupling to a machine tool, characterized in that connected to the clamping shank is a bracing arrangement which, in an axial bracing section of the clamping shank, subjects the clamping shank to a bracing force with a bracing-force component acting in the axial direction, it being the case that, in the bracing section, at least one of the components - clamping shank and bracing arrangement - is designed as a sleeve (20) which encloses the respectively other component (18) coaxially.

2. The tool holder as claimed in claim 1, characterized in that the bracing section is arranged in the axial direction between the clamping formation (14) and the coupling formation (12).

3. The tool holder as claimed in claim 2, characterized in that the clamping formation (14) projects beyond the sleeve (20) and is designed for securing the tool with a shrink fit.

4. The tool holder as claimed in one of claims 1 to 3, characterized in that the sleeve (20, 20a-f, n, l, m, o, p, s-u, z, aa) is supported on the tool holder (10) such that its ends can be pushed away from one another under tensile loading, and the clamping shank comprises a shank section (18) which connects the coupling formation (12) to the clamping formation (14) such that it can be subjected to compressive loading.

5. The tool holder as claimed in claim 4, characterized in that at its end (26), which is in the vicinity of the clamping formation (14), the sleeve (20) engages behind an annular shoulder (30) of the clamping shank, this annular shoulder being oriented away from the coupling formation (12), and at its other end (32), the sleeve is screwed to the tool holder or fixed to the tool holder in particular by a non-releasable joining method, in particular welding.

6. The tool holder as claimed in claim 5, characterized in that, at the other end (32), the sleeve (20) has a radially outwardly projecting annular collar (34) which is screwed against a radially outwardly extending annular shoulder (43) of the coupling formation (12).

7. The tool holder as claimed in claim 5, characterized in that, at the other end (32), the sleeve (20d-f) has an internal thread (44) which is screwed on to an external thread (46) of the clamping shank.

8. The tool holder as claimed in claim 4, characterized in that, at its end (26), which is in the vicinity of the clamping formation (14), the sleeve (20b, c, n, s) engages behind an annular shoulder (33) of the tool holder in the region of the clamping formation (14), this annular shoulder being oriented away from the coupling formation (12), or is connected integrally to the tool holder and, at its other end (32), the sleeve is connected integrally to the tool holder, in particular to a radially outwardly projecting annular collar (43) of the coupling formation (12), and in that, in the bracing region, the clamping shank is supported in a force-fitting and form-fitting manner on a tool holder surface which is fixed to the coupling formation (12).

9. The tool holder as claimed in claim 4, characterized in that the sleeve (20s) is fixed, in particular connected integrally, both to the clamping formation (14s) and to the coupling formation (12s), and the region of the clamping formation is supported on the region of the coupling formation (12s) via the shank section (18s).

10. The tool holder as claimed in claim 9, characterized in that the shank section (18s) is designed as a component which is separate from the clamping formation (14s) and the coupling formation (12s).

11. The tool holder as claimed in one of claims 1 to 3, characterized in that the sleeve (20g, h-k, q, r, u-x, bb, cc, dd) is supported on the tool holder at its ends (26, 32) such that the latter can be pushed toward one another under compressive loading, and the clamping shank comprises a shank section (18) which connects the coupling formation (12) to the clamping formation (14) such that it can be subjected to tensile loading.

12. The tool holder as claimed in claim 11, characterized in that the sleeve (20g, h, i, q, r, w, x) has one of its axial ends supported on the coupling formation (12), in particular on a radially projecting annular collar (43) of the coupling formation (12), and has its other end supported on an annular shoulder of a component (56, 56n, 58, 80, 95) which can be screw-connected axially relative to the coupling formation.

13. The tool holder as claimed in claim 12, characterized in that the component is designed as a screw-connection ring (56) which is screwed on to the clamping shank.

14. The tool holder as claimed in claim 12, characterized in that the annular shoulder is

integrally formed on the clamping shank (18h, i) and the clamping shank is screw-connected to the region of the coupling formation.

15. The tool holder as claimed in claim 12, characterized in that the other end of the sleeve (20q) is supported on an annular shoulder of the tool (80) which is retained in the clamping formation.

16. The tool holder as claimed in claim 12, characterized in that, the annular shoulder (79r) is integrally formed on the clamping formation (14r), and the latter is fastened in an axially displaceable manner on the clamping shank (18r).

17. The tool holder as claimed in claim 11, characterized in that the sleeve (20v) has one of its axial ends supported on the coupling formation (12), in particular on a radially projecting annular collar (43) of the coupling formation (12), and has its other end supported in a frictionally fitting manner on the clamping shank (18v).

18. The tool holder as claimed in one of claims 1 to 17, characterized in that the sleeve (20b, f-s, u-z, aa-cc) has an external and/or internal diameter which increases in the direction of its end which is adjacent to the coupling formation (12).

19. The tool holder as claimed in one of claims 1 to 18, characterized in that the sleeve (20o) comprises a plurality of sleeve shells (67, 68) which are arranged coaxially in relation to one another.

20. The tool holder as claimed in claim 19, characterized in that the sleeve shells (67, 68) butt against one another at least over a part of their axial length.

21. The tool holder as claimed in claim 19 or 20, characterized in that one of the sleeve shells (67, 68) is subjected to compressive loading and another of the sleeve shells (67, 68) is subjected to tensile loading.

22. The tool holder as claimed in one of claims 1 to 21, characterized in that formed radially between the sleeve (20p, aa) and the shank section (18) is an annular space (66) which is filled with a material which is subjected to pressure, in particular with a free-flowing material or a plastically deformable or elastic material.

23. The tool holder as claimed in claim 22, characterized in that the axial ends of the sleeve (20p, aa) are connected in a tension-resistant and sealed manner to the tool holder (10), in particular are friction-welded thereto, and in that the sleeve (20) encloses the clamping shank (18) with radial spacing and, in order to produce axial tensile bracing of the sleeve (20), material which is subjected to pressure, in particular elastic material is introduced between the clamping shank (18) and the sleeve (20).

24. The tool holder as claimed in claim 22 or 23, characterized in that pressure-changing means (76) are provided and can be used to change the pressure of the material in the annular space (66).

25. The tool holder as claimed in one of claims 1 to 24, characterized in that the shank section (18) or the sleeve (20) - insofar as this component is subjected to compressive loading - is supported axially via a damping element (59) relative to the other component, which is subjected to tensile loading.

26. The tool holder as claimed in one of claims 1 to 25, characterized in that, at least over part of its axial length, the sleeve (20v-z, bb) butts in a

frictionally fitting manner against the circumference of the clamping shank (18).

27. The tool holder as claimed in claim 26, characterized in that the sleeve (20v-z, bb) has its two ends supported in an axially prestressed manner on the tool holder (10), that end of the sleeve (20) which is axially in the vicinity of the clamping formation (14) being retained on the clamping shank (18) such that it is fixed axially in a frictionally fitting manner, with press-fit action, in a friction-fit section (89).

28. The tool holder as claimed in claim 26 or 27, characterized in that the sleeve (20v-z, bb) and the clamping shank (18v) adapted to one another at least over part of the friction-fit section (89), are of slightly conical form.

29. The tool holder as claimed in one of claims 26 to 28, characterized in that the sleeve (20v-x, bb) is supported on the tool holder (10) such that it is prestressed axially under compressive loading, and it encloses the clamping shank (18) with radial spacing in the axial direction between the friction-fit section (89) and the end which is directed axially toward the coupling formation (12) and is supported on the tool holder (10).

30. The tool holder as claimed in claim 29, characterized in that in the axial direction between the friction-fit section (89) and the other end, which is supported on the tool holder (10v), at least one damping ring (94) made of an elastically compressible material is arranged between the circumference of the clamping shank (18) and the inner lateral surface of the sleeve (20v).

31. The tool holder as claimed in one of claims 1 to 30, characterized in that the clamping shank (18) merges into an annular shoulder (41) of the coupling formation (12) and the sleeve (20) is supported axially on the annular shoulder (41), and in that at least the end (32) of the sleeve (20b, c, f-s, v-z, aa-dd), this end being supported on the annular shoulder (41), is designed as a conical section which tapers axially away from the annular shoulder (41).

32. The tool holder as claimed in claim 31, characterized in that the conical section covers over at least one damping ring (94).

33. The tool holder as claimed in claim 31 or 32, characterized in that the sleeve is prestressed axially under compressive loading.

34. The tool holder as claimed in one of claims 1 to 33, characterized in that the sleeve (20x) comprises an axially resilient zigzag-spring section (97).

35. The tool holder as claimed in one of claims 1 to 34, characterized in that the sleeve (20bb) has its two ends supported axially on the tool holder (10), there being arranged in the supporting path of one of the two ends of the sleeve (20bb) a supporting device (100) which can be moved axially relative to the tool holder (10) and has at least one supporting piston (103), which is guided in an axially displaceable manner in an associated pressure chamber (102) which contains a free-flowing or plastically deformable pressure medium (101), the pressure chamber (102) being assigned an adjusting element (104) for changing the pressure in the pressure medium (102).

36. The tool holder as claimed in claim 35, characterized in that the supporting piston (103) is designed as an annular piston which can be displaced

axially in an annular space forming a pressure chamber (102) and on which one of the two ends of the sleeve (20bb) is supported or to which this end is connected.

37. The tool holder as claimed in claim 35 or 36, characterized in that the adjusting element (104) is a piston screw which acts on the pressure medium (101).

38. The tool holder as claimed in one of claims 35 to 37, characterized in that the other of the two ends of the sleeve (20bb) is fixed to the clamping shank (18), or is supported axially on an annular collar of the clamping shank (18), in particular on a securing ring (95bb) which is retained in a releasable manner on the clamping shank (18).

39. The tool holder as claimed in one of claims 1 to 38, characterized in that, at least over part of its axial length, the sleeve (20cc) encloses the shank section (18) with radial spacing to form an annular space (111), and arranged in a radially prestressed manner in the annular space (111) is an annular damping element (112) which is in surface abutment against the inner circumferential surface (113) of the sleeve and the outer circumferential surface (29cc) of the shank section (18cc).

40. The tool holder as claimed in claim 39, characterized in that the damping element (112) consists of elastically compressible material, and in that the annular space (111) is bounded axially by annular shoulders (115, 117), between which the damping element (112) is braced axially in order to produce radial prestressing.

41. The tool holder as claimed in claim 40, characterized in that one of the annular shoulders (117dd) can be displaced axially in order to change the prestressing of the damping element (112).

42. The tool holder as claimed in claim 41, characterized in that the axially displaceable annular shoulder (117dd) is formed by an axially displaceable screw-connection arrangement (119) which is retained on the coupling formation (12dd).

43. The tool holder as claimed in claims 39 to 42, characterized in that the annular space (111) is conical.

44. The tool holder as claimed in claim 43, characterized in that the damping element (112) is prestressed in the direction of the tapering of the conical annular space (111).

45. The tool holder as claimed in one of claims 1 to 44, characterized in that, at least over part of its axial length, the sleeve (20m, n, o) encloses the shank section (18) with radial spacing to form an annular space, and in that an absorption-mass body (65m, n, o) is arranged on the shank section (18) in the annular space.

46. The tool holder as claimed in claim 45, characterized in that the absorption-mass body (65m, n, o) can be displaced along the shank section (18).

47. The tool holder as claimed in one of claims 1 to 46, characterized in that the two components - clamping shank and bracing arrangement - consist of different materials.

48. The tool holder as claimed in claim 47, characterized in that one of the components, in particular the sleeve (20), at least in its region which transmits the axial bracing force, consists of hard metal or heavy metal or a metal matrix composite

material or ceramic or plastic, in particular glass-fiber-reinforced or carbon-fiber-reinforced plastic.

49. The tool holder as claimed in one of claims 1 to 48, characterized in that one of the two components - clamping shank and bracing arrangement - is supported on the other of the two components via at least one joint (22, 22a, h, i, q, r, s, v - z, aa - gg, 24, 24a - i, n, q, r, v - z, aa - gg) which transmits the axial bracing force.

50. The tool holder as claimed in claim 49, characterized in that the joint (24v - z, bb) is provided between two circumferential surfaces of the two components which butt against one another with radial press-fit action.

51. The tool holder as claimed in claim 49 or 50, characterized in that the joint (22, 22a, h, i, q, r, s, v - z, aa - dd, 24, 24a - i, n, q, r, w - z, aa - gg) is provided between two axially abutting surfaces of the two components.

52. The tool holder as claimed in one of claims 49 to 51, characterized in that a damping-material layer (59; 59t) is arranged between the two joint-forming surfaces.

53. The tool holder as claimed in one of claims 49 to 52, characterized in that at least one of the two axial ends of the sleeve-forming component forms one of the abutting surfaces of the joint, and a circumferential surface (120) is integrally formed, or fitted, on the other of the two components and centers the sleeve radially in the region of this end.

54. The tool holder as claimed in claim 53, characterized in that the joint-forming surfaces are provided in each case at the two ends of the sleeve,

and the sleeve is centered radially in the region of the two ends by circumferential surfaces of the other component.

55. The tool holder as claimed in claim 53 or 54, characterized in that the circumferential surface of the other component butts with radial press-fit action against a circumferential surface of the sleeve.

56. The tool holder as claimed in one of claims 53 to 55, characterized in that the circumferential surface of the other component encloses the sleeve in a radially outward direction in the region of at least one of its axial ends.

57. The tool holder as claimed in claim 56, characterized in that at least that end of the sleeve which is adjacent to the clamping formation is enclosed in the radially outward direction by the circumferential surface of the other component.

58. The tool holder as claimed in claim 56 or 57, characterized in that that circumferential surface of the other of the two components which encloses the sleeve (20ff) in the radially outward direction in the region of at least one of its ends, in particular in the region of its end (26ff), which is adjacent to the clamping formation (14ff), is formed by a ring (119ff) which covers over the joint axially and also encloses the other component in the radially outward direction.